

WHAT IS CLAIMED IS:

1. A heterojunction bipolar transistor comprising a collector layer, a base layer and an emitter layer, wherein the collector layer, the base layer and the emitter layer have different lattice constants of a_c , a_b and a_e respectively, and a value of a_b is between values of a_c and a_e .

2. The heterojunction bipolar transistor according to claim 1, wherein the values of a_c , a_b and a_e satisfy a relationship of $a_c > a_b > a_e$.

3. The heterojunction bipolar transistor according to claim 1, wherein the values of a_c , a_b and a_e satisfy a relationship of $a_c < a_b < a_e$.

4. The heterojunction bipolar transistor according to claim 1, wherein the heterojunction bipolar transistor is of an emitter-up type, and the values of a_e and a_b satisfy a relationship of $|a_e - a_b|/a_b \times 100 \leq 0.3$ (%).

5. The heterojunction bipolar transistor according to claim 4, wherein the values of a_e and a_b satisfy a relationship of $|a_e - a_b|/a_b \times 100 \leq 0.1$ (%).

6. The heterojunction bipolar transistor according to claim 1, wherein the heterojunction bipolar transistor is of an emitter-up type, and the values of a_b and a_c satisfy a relationship of $|a_b - a_c|/a_c \times 100 \leq 0.3$ (%).

7. The heterojunction bipolar transistor according to

claim 6, wherein the values of a_b and a_c satisfy a relationship of $|a_b - a_c|/a_c \times 100 \leq 0.1$ (%).

8. The heterojunction bipolar transistor according to claim 1, wherein the heterojunction bipolar transistor is of a collector-up type, and the values of a_c and a_b satisfy a relationship of $|a_c - a_b|/a_b \times 100 \leq 0.3$ (%).

9. The heterojunction bipolar transistor according to claim 8, wherein the values of a_c and a_b satisfy a relationship of $|a_c - a_b|/a_b \times 100 \leq 0.1$ (%).

10. The heterojunction bipolar transistor according to claim 1, wherein the heterojunction bipolar transistor is of a collector-up type, and the values of a_b and a_e satisfy a relationship of $|a_b - a_e|/a_e \times 100 \leq 0.3$ (%).

11. The heterojunction bipolar transistor according to claim 10, wherein the values of a_b and a_e satisfy a relationship of $|a_b - a_e|/a_e \times 100 \leq 0.1$ (%).

12. The heterojunction bipolar transistor according to claim 1, wherein an InGaP/GaAs heterojunction is applied.

13. The heterojunction bipolar transistor according to claim 1, wherein an InP/InGaAs heterojunction is applied.

14. The heterojunction bipolar transistor according to claim 1, wherein the emitter layer comprises a first emitter layer and a second emitter layer, the first emitter layer is sandwiched between the base layer and the second emitter layer, the first and second emitter layers have lattice

constants of a_{e1} and a_{e2} respectively, a value of a_{e2} corresponds to the value of a_e , and the values of a_{e2} and a_b satisfy a relationship of $|a_{e2}-a_b|/a_b \times 100 > 0.3$ (%).

15 16. The heterojunction bipolar transistor according to claim 1, wherein the collector layer comprises a first collector layer and a second collector layer, the first collector layer is sandwiched between the base layer and the second collector layer, the first and second collector layers have lattice constants of a_{c1} and a_{c2} respectively, a
10 value of a_{c2} corresponds to the value of a_c , and the values of a_{c2} and a_b satisfy a relationship of $|a_{c2}-a_b|/a_b \times 100 > 0.3$ (%).

15 16. The heterojunction bipolar transistor according to claim 1, wherein the value of a_b is between the values of a_c and a_e at a junction temperature.